Bootstrapping star positions and baseline knowledge with uncalibrated SIM observations.

Authors: Joe Catanzarite, Ipek Basdogan, Mark Milman

The external calibration technique proposed for SIM (Space Interferometry Mission) requires a priori knowledge of the positions of a set of calibration stars(within a 15 degree field) to 2 milliarcseconds (see paper by Papalexandris and Milman, this conference) . Additionally apriori knowledge of baseline orientation must be accurate to about 20 milliarcseconds.

As existing star catalogs fall short of the required star position precision by an order of magnitude, and the attitude control system can only give the baseline orientation to within a few arcseconds, we were motivated to ask whether the required accuracies could be achieved by observing the calibration stars with SIM prior to the calibration of its angle-dependent errors.

We present the results of an investigation showing that 'bootstrapping' can be successfully employed to obtain the required improvement in knowledge of star positions and baseline orientations.

We simulated delay observations of 100 calibration stars in a 15 degree square field with a model SIM instrument(see paper by Basdogan et. al., this conference) in each of three baseline orientations. The star positions are assumed initially known to 20 milliarcseconds. A

straightforward analysis of the delay data yielded estimated star positions with RMS residuals of less than 2 milliarcseconds, and estimated baseline orientations were accurate to 20 mas.

We discuss the observing scenario, the spacecraft/instrument model, the simulated observations the analysis of the data and the interpretation of our results. We also consider the effect of systematic catalog errors on our result